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EFFECTS OF PRESCRIBED FIRES ON HABITAT USE BY WINTERING RAPTORS ON A TEXAS BARRIER ISLAND GRASSLAND

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KEY WORDS: *American kestrel*; Circus cyaneus; Falco sparverius; *fire; habitat use; northern harrier; Texas.*

The structure of vegetation at ground level in grasslands appears to be of greater importance than prey abundance in selection of hunting sites by birds of prey (Janes 1985, Preston 1990). Land management practices that affect raptor habitat will, therefore, be those that affect vegetation structure rather than impact solely prey abundance (Millsap et al. 1987). Fire can affect raptors primarily by altering the quality of habitat parameters such as cover and prey availability. Burning and maintaining grasslands provides habitat for northern harriers (*Circus cyaneus*) and short-eared owls (*Asio flammeus*) (Hamerstrom 1974) during the breeding season. Considerably less is known about the effects of prescribed fires on winter habitat use by raptors.

In monitoring the effects of fire on animal communities researchers have generally considered periods of one or more years post-burn (Peterson and Best 1987, Pylypec 1991). Considerably less effort has been made to monitor the immediate effects of fire on wildlife communities. As suitable wintering habitats become limiting, understanding the immediate effects the management practices that

Table 1. Raptor species and number of individuals observed during winter road surveys on Matagorda Island, Texas during 1992–93 winter.

	DECEMBER		JANUARY		FEBRUARY
	2	26	17	29	7
Crested caracara (*Caracara plancus*)	6	3	5	5	3
American kestrel (*Falco sparverius*)	9	12	15	6	21
Peregrine falcon (*F. peregrinus*)	1	0	0	0	0
Merlin (*F. columbarius*)	0	0	1	0	0
Northern harrier (*Circus cyaneus*)	31	30	38	37	52
Black-shouldered kite (*Elanus caeruleus*)	17	7	6	2	2
White-tailed hawk (*Buteo albicaudatus*)	5	4	7	12	4
Red-tailed hawk (*B. jamaicensis*)	2	2	3	2	6
Total	71	58	75	64	88

drastically alter vegetation structure (e.g., prescribed fire or shredding) have on habitat use patterns by migrant birds becomes increasingly important. We studied raptor use of a natural grassland immediately before and after winter prescribed burns were applied. Our objective was to identify changes in species composition and degree of raptor use shortly after the burning of a grassland.

METHODS

The study was conducted on Matagorda Island National Wildlife Refuge and State Natural Area in Calhoun County, Texas. This barrier island is approximately 4 × 61 km and has an area of 22 934 ha. Vegetation types on the island include beach dune complex, upland barrier flats, and saltmarsh (Blankenship 1990). The interior upland barrier flats of the island is a grassland dominated by marshhay cordgrass (*Spartina patens*), gulfdune paspalum (*Paspalum monostachyum*), and seacoast bluestem (*Schizachyrium scoparium*) with sparse woody vegetation composed of mesquite (*Prosopis juliflora*) and false willow (*Baccharis neglecta*).

As part of ongoing burn studies, two 140-ha plots were burned on 4–5 January 1993. Raptor use at each of the two plots was evaluated by conducting 1-hr counts at weekly intervals, between 13 December 1992 and 14 February 1993—4 wk pre-burn to 4 wk post-burn. Observers walked slowly through the middle of each plot during the count and all raptors noted within the study plot were recorded. Care was taken to track raptors while in the plots to avoid double counting individuals. Five road surveys were conducted biweekly, from 2 December to 7 February, to determine presence and relative abundance of raptors wintering on the island during the study period. Road surveys were 58 km long and were conducted along the single road that runs lengthwise through the middle of the island Surveys were conducted during favorable weather (good visibility, no rain or extreme winds) and started between 0800 and 0900 H.

Kendall's *tau* measure of rank correlation (Conover 1980) was used to evaluate changes in numbers of total raptors, northern harriers, and American kestrels (*Falco sparverius*) observed in road surveys. Differences in raptor use (excluding Cathartidae) between plots and pre- and post-burn within plots were evaluated with Mann-Whitney *U*-tests (Conover 1980). Similarity in raptor species composition was compared between plots pre-burn, post-burn, and pre- and post-burn within plot using the chord distance method (Ludwig and Reynolds 1988). Chord distance (CD) values range from 0 (maximum similarity) to 1.41 (maximum dissimilarity).

RESULTS

Vegetative cover on study plots was reduced from about 100% ground cover pre-burn to nearly 0 after burns. Based on road surveys (Table 1), the total number of raptors increased positively ($\tau = 0.5$) throughout the study period, however, not significantly so ($P > 0.05$). Total number of raptors observed at both plots pre- and post-burn were similar (Table 2) with slight and moderate decreases observed at plots B and A, respectively. Non-significant differences were observed pre- and post-burn between plots (pre-burn $U = 18.5$, df = 15, $P > 0.05$, post-burn $U = 24$, df = 15, $P > 0.05$) so data from both plots were pooled. Number of total raptors observed post-burn were not significantly different from pre-burn numbers ($U = 72.5$, df = 15, $P > 0.05$). Pre- and post-burn species composition

Table 2. Raptor species and number of individuals observed during pre-burn (Pre) and post-burn (Post) surveys and percent change at two study plots on Matagorda Island, Texas.

	PLOT A			PLOT B		
	PRE	POST	% CHANGE	PRE	POST	% CHANGE
Crested caracara	0	1		0	0	
American kestrel	1	4	+300	1	6	+500
Peregrine falcon	0	0		0	1	
Merlin	1	0		1	1	
Northern harrier	17	8	−53	22	14	−36
White-tailed hawk	0	0		1	1	
Short-eared owl	1	0		0	0	
Total	20	13	−35	25	23	−8

of communities at each plot were the most dissimilar (CD = 0.42 plot A, CD = 0.36 plot B), while raptor communities were most similar between plots pre-burn (CD = 0.08) and post-burn (CD = 0.17).

Only northern harriers and American kestrels were observed in sufficient numbers to evaluate changes post-burn and were the most common raptors observed in road surveys and study plots (Tables 1 and 2). Harriers and kestrels showed positive increases (τ = 0.6 and 0.4, respectively) throughout the study period, but increases were not statistically significant ($P > 0.05$). In study plots northern harriers decreased significantly (U = 85, df = 15, $P < 0.05$), by 53% (plot A) and 36% (plot B) post-burn, while American kestrels increased significantly (U = 49, df = 15, $P < 0.05$), by 300% (plot A) and 500% (plot B).

DISCUSSION

Winter burns on Matagorda Island did not appear to have short-term effects overall on wintering raptor numbers. The total number of wintering raptors using an area pre- and post-burn did not change significantly; however, species composition did, primarily due to changes in number of harriers and kestrels.

The decreases in northern harriers on burned plots is contrary to the increasing numbers observed in road survey counts. The decrease in harriers post-burn was likely due to the elimination of vegetative structure, since harriers are surprise hunters flying low over vegetation, then pouncing on prey (Schipper et al. 1975). Harrier hunting success is lowered in areas with dense vegetation compared to areas with sparse vegetation (Collopy and Bildstein 1987). However, as observed in this study, complete elimination of vegetative cover significantly decreased habitat use by harriers. Harriers, and other raptors, have been previously reported to avoid bare ground for hunting (Preston 1990).

The increase in American kestrels post-burn may correspond to the slight increases observed on road surveys, but may be due to the elimination of vegetative structure, since they prefer to hunt in open habitats with low vegetative structure (Smallwood 1987). Hunting success by kestrels decreases significantly with increasing vegetation height (Toland 1987). Increased use by kestrels post-burn on Matagorda Island may have been in response to the recent disturbance created by the fire. Kestrels have responded positively to human-related disturbances, such as crop harvesting (Toland 1987), irrigation (Rudolph 1982), and controlled fires (Smallwood et al. 1982).

Our results show that wintering harriers and kestrels can be affected by prescribed fires. The effect of burns on habitat use patterns, however, needs further study. For example, do harriers and kestrels change territory size and/or shape after habitat modifications occur from burning? Do raptors alter hunting and foraging behavior in response to burned areas? More intense studies are necessary to evaluate changes in habitat use patterns, before and after burns.

RESUMEN.—Estudiamos los efectos de quema controlada en el uso de habitat por rapaces invernantes en un pastizal natural en la costa de Texas. Dos areas de 140 ha se selecionaron para estudio y se quemaron el 4 y 5 de Enero de 1993. Ocho de diez rapaces invernantes y residentes utilizaron las areas de estudio. Los numeros de rapaces totales sufrieron cambios moderados en ambas areas despues de la quema. La composicion de especies cambio en las dos areas despues de la quema con la aguililla rastrera (*Circus cyaneus*) y el halcon cernicalo (*Falco sparverius*) mostrando los cambios mas significantes. El numero de aguilillas rastreras disminuyo significantemente ($P < 0.05$) 53% y 36% en las dos areas, mientras el numero de cernicalos aumento significantemente ($P < 0.05$) 300% y 500%.

[Traducción Autores]

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WINTER DIET OF LONG-EARED OWLS (*ASIO OTUS*) IN THE PO PLAIN (NORTHERN ITALY)

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KEY WORDS: *food habits; diet; Italy; long-eared owl*; Asio otus.

The winter diet of the long-eared owl (*Asio otus*) has been well documented in northern and central Europe and North America (see Cramp 1985 for review), but there are few data for southern Europe and particularly Italy. In northern Europe, the long-eared owl specializes in hunting voles (*Microtus* spp.) in open fields (Herrera and Hiraldo 1976), and it is considered a restricted feeder (Marti 1976, Källander 1977, Nilsson 1981). Likewise, in the Mediterranean region voles are the most important component in the diet of long-eared owls (Araujo et al. 1973, Tome 1991). Only three studies (Gerdol and Perco 1977, Casini and Magnaghi 1988, Canova 1989) have reported the diet and prey selection of long-eared owls in the Po Plain of northern Italy, which is the most important part of their Italian wintering and breeding range (Galeotti 1990).

In this paper, we review the diet of long-eared owls in the Po Plain to: (1) provide new information on the trophic niche of southern wintering populations of long-eared owls, (2) compare local diets, and (3) determine the hunting habitats most utilized by the species.

STUDY AREAS AND METHODS

This area has a sublittoral continental temperate climate with two peaks of rainfall in spring and autumn; during winter the mean temperature ranges from 0–10°C and precipitation averages 50–60 mm monthly.

Pellets were collected between January and March from eight winter roosts located in the Po Plain. Roosts 1, 2, and 3 (Table 1) were close to the eastern edge of the study area, a few kilometers from the Adriatic Sea, while all other roosts were located in Lombardy, the central part